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Client No. 149015/LS/BP/-

## SUBSTITUTE SPECIFICATION

### HYBRID RISER CONFIGURATION

**RECEIVED**

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**GROUP 3600**

#### FIELD OF THE INVENTION

[0001] The present invention relates to a hybrid riser configuration, primarily for offshore hydrocarbon services.

#### BACKGROUND OF THE INVENTION

[0002] The hybrid riser concept has developed from top tension risers. A principal feature is that it accommodates relative motion between a floating structure and a rigid metal riser by connecting them with flexible jumpers. The first hybrid riser installed, and so far the only, was a single riser anchored to the structure with a tensioned cable. Current concepts mainly involve multiple risers with tension provided by submerged buoyancy anchored by a tether.

[0003] A principal advantage of hybrid risers tensioned by submerged buoyancy is that they are much less exposed to wave-induced cyclic loads and are not excited significantly by vessel motion either. The challenge of such designs is to accommodate the relative deformation between the central tether and the risers. The risers are subjected to temperature, internal pressure, and lateral deflection, which give rise to relative deformation.

[0004] Several solutions accommodating these relative deformations can be envisioned. The most efficient solution will depend on project-specific conditions, and there may not be one single design solution which is more cost effective in all cases. The most attractive solution will be the one minimizing the major cost drivers, which are syntactic foam

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